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Wicking Behaviour of Viscose Staple Yarns Differing in Linear Densities

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Abstract

Comfort properties of textiles are extremely important. It is sometimes more important than the aesthetic properties when the garment are next to skin. Among all comfort properties, good absorption and easy drying is one of the major requirements. Wetting and wicking are two related processes. A liquid that does not wet fibres cannot wick in to a fabric, and wicking can only occur when fibers assembled with capillary spaces between them are wetted by a liquid. Viscose staple yarns were spun with different linear densities and the yarns properties and wicking behaviour were examined. Viscose yarns with coarser counts showed maximum wicking behaviour compared to finer counts.

Key words: *Absorbency; Capillary spaces; Wetting; Wicking .*

1. INTRODUCTION

Comfort properties of textiles are extremely important. It is sometimes more important than the aesthetic properties when the garments are next to skin. Among all comfort properties good absorption and easy drying is one of the major requirements. When we do some physical work, we sweat. Garments which are next to skin should absorb this sweat quickly and transport it to the outer surfaceof the garment. From the outersurface ofthe skin,sweat should be evaporated quickly tokeep the body dry and cool.All these desired phenomena come under one technical term called"Moisture Management". It is clear that absorption of water and its transport to different parts of textiles followed by its evaporation is the major requirement. Transport of water to different parts of fabric is called 'Wicking'.

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Wetting and wicking are two related processes. A liquid that does not wet fibers cannot wick in to a fabric, and wicking can only occur when fibers assembled with capillary spaces between them are wetted by a liquid. The resultant capillary forces drive the liquid into the capillary spaces. Fiber wettability is therefore a prerequisite for wicking. All the manmade fibers except rayon and acetate are hydrophobic in nature. The molecular structure of viscose is more amorphous than that of cotton or linen, making the viscose fibers more absorbent than the natural cellulosic fibers. Moisture regain is 13 percent in viscose and accepts dyes readily, because of its increased absorbency. The absorbency of the fiber makes clothing of viscose comfortable to wear. Viscose rayon will absorb twice as much water naturally from the air as cotton does.

The majority of the previous studies deal with the wicking behavior of regular ring, jet ring, compact

cotton and nylon yarns. So the investigator has made an attempt to study the wicking behavior of viscose staple yarns differing in linear densities of 16^s(36.91tex), 20^s(29.53tex), 24^s(24.6tex), 30^s(19.68tex), 34^s(17.37tex),40^s(14.76tex) and 60^s(9.84tex) respectively.

The major objectives of the study are

- To spin the viscose fibers with different counts
- To test the yarns for the selected quality parameters
- To test the wicking behavior of viscose yarns with various counts
- To compare the wickability of viscose yarns among its various counts

2. EXPERIMENTAL PROCEDURE

Viscose staple fibres of 1.2 denier and 38 mm length was selected and the viscose yarns were spun with various linear densities using the conventional ring spinning method and tested for properties like twist, count, lea strength, count strength product (CSP), single yarn tenacity, elongation, RKM ,hairiness index and imperfections. In order to remove the spin finishes the yarns were treated with hot water and then subjected to wicking behaviour in distilled water.

3. RESULTS & DISCUSSION

From the results it is apparent that, viscose yarns with coarser count have lesser twist levels compared to finer counts. The single yarn strength and elongation is higher for the coarser yarn compared to finer count. Higher the tenacity, better the yarn. However the total imperfections and U% are found to be higher in yarns with finer counts. The yarn diameter is higher in 16^s(36.91 tex) sample with lower counts. Higher the diameter, lesser the compactness and vice versa. The yarn hairiness is minimum in finer counts due to higher twist level which traps all the protruding fibres.

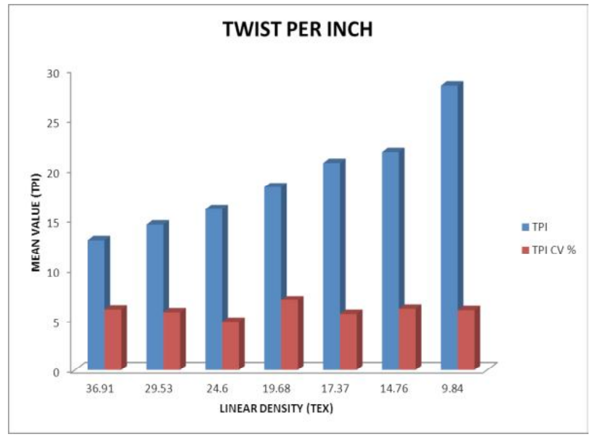

Fig. 1: TPI & CV%

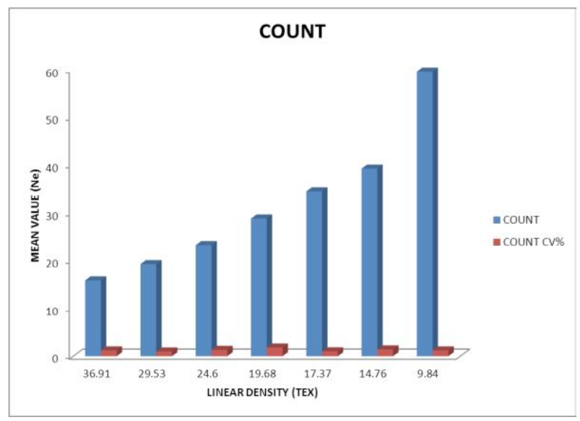

Fig. 2: Count & CV%

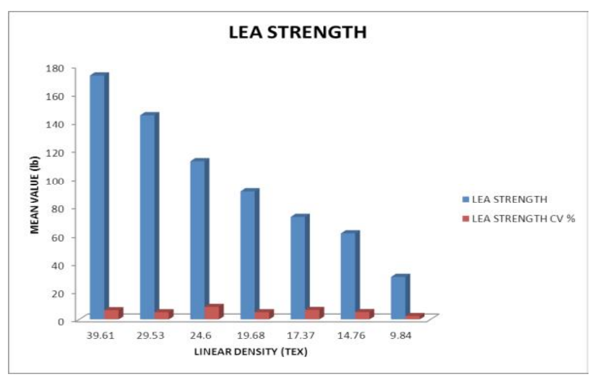

Fig. 3: Lea strength & CV %

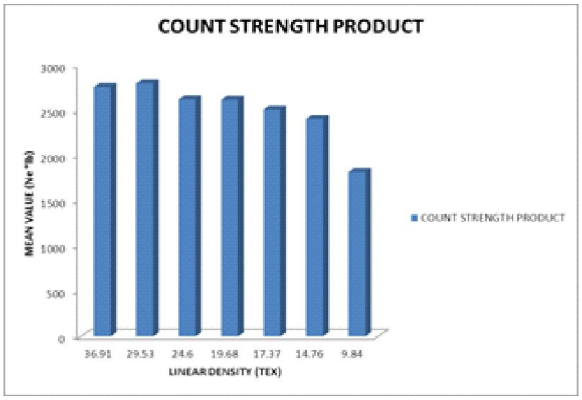

Fig. 4: Count Strength Product

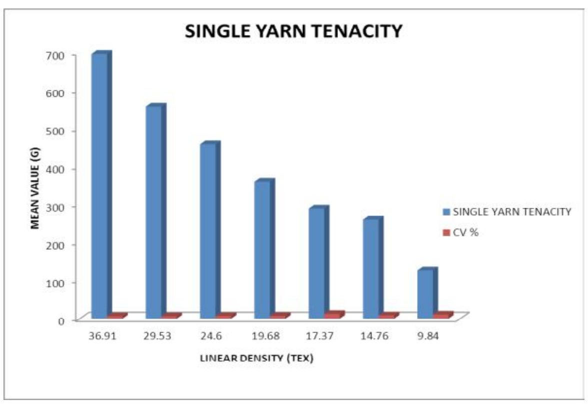

Fig. 5: Single Yarn Tenacity & CV%

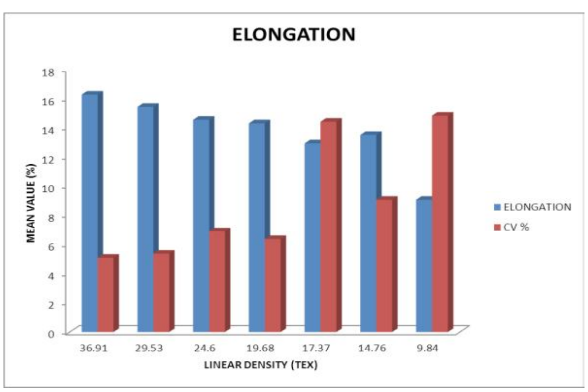

Fig. 6: Elongation & CV%

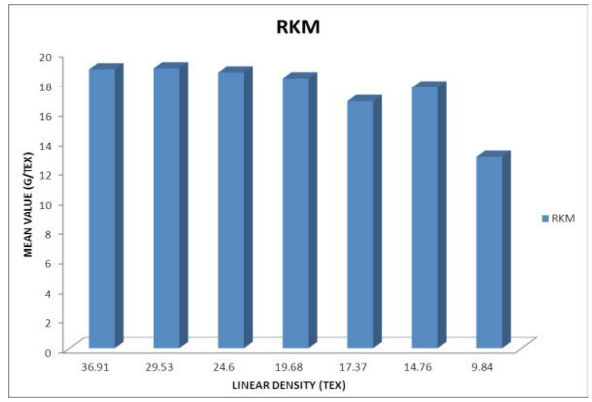

Fig. 7: RKM

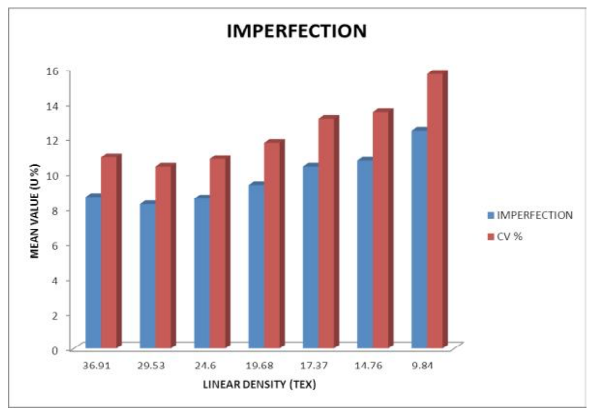

Fig. 8: Imperfection & CV%

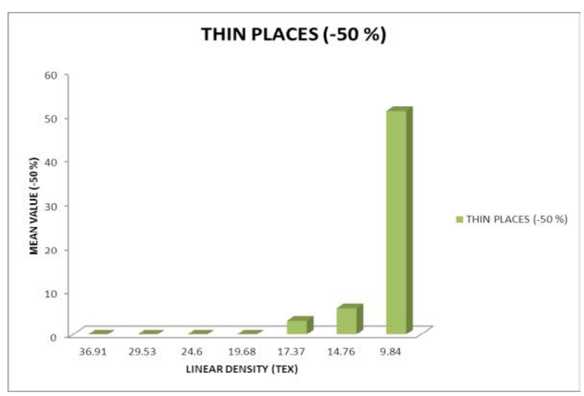

Fig. 9: Thin Places (-50%)

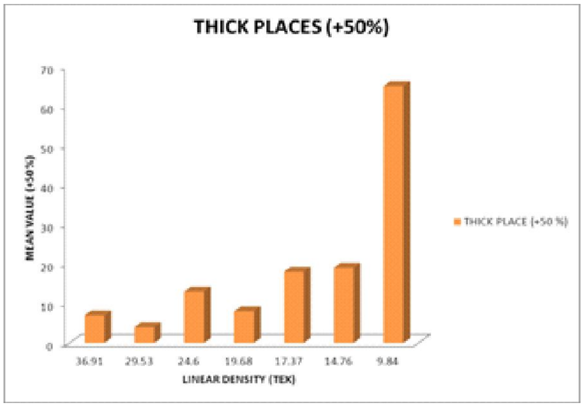

Fig. 10: Thick Places (+50%)

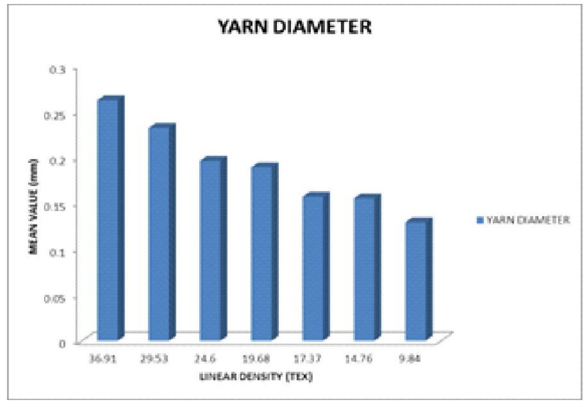

Fig. 13: Yarn Diameter

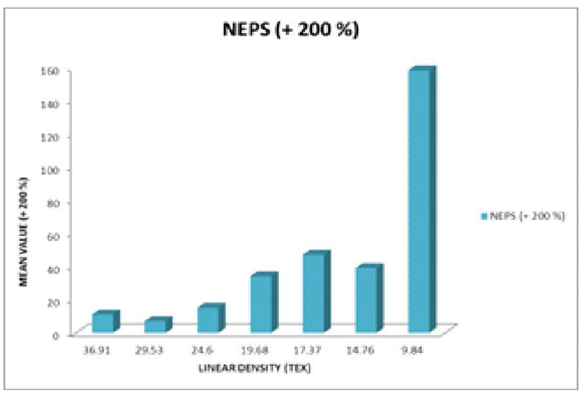

Fig. 11: Neps (+200 %)

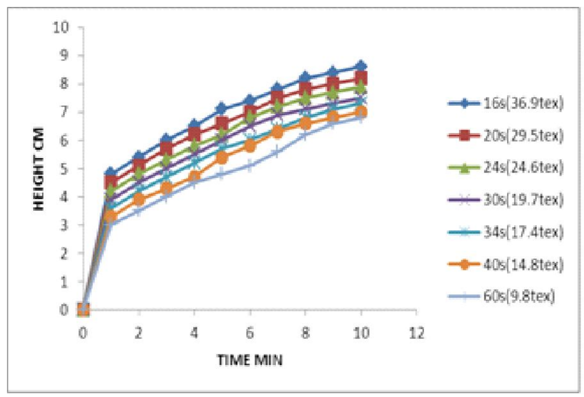

Fig. 14: Wicking Behaviour – Height & Time

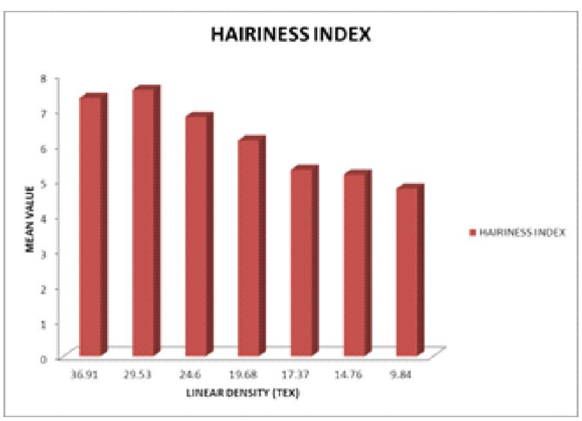

Fig. 12: Hairiness Index

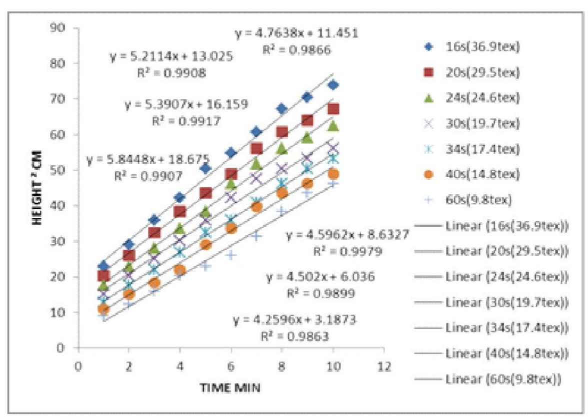

Fig. 15: Wicking Behaviour – Height Square and Time

In Fig. 14, the wicking height was plotted against the wicking time. It is clear that higher the slope better the wickability , lower the slope indicates minimum wicking behaviour. In Fig.15, the square of wicking height was plotted against the time and the correlation coefficient and regression equations were computed. It is apparent that the yarns with lower counts showed higher values of slope and intercept compared to other yarns implying that they have lower wicking ability. A good linear relationship between the square of height and time was found.

4. CONCLUSION

It may be concluded that the yarns with coarser counts showed maximum wicking behaviour compared to finer counts. The wicking height shows a reduction as the count becomes finer due to the presence of discontinuous capillaries and tortuous paths the liquid has to take. It may be noted that the wickability can be taken as a measure of compactness; the lower the wickability, better is the compactness and vice versa.

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